




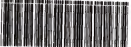



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Procès-verbal de la Réunion exécutive de Londres
le 17 Octobre 1934

X-TC 625 #2
M 65

REPORT
OF
SELECT COMMITTEE
TO THE
HOUSE OF REPRESENTATIVES
OF THE
WISCONSIN LEGISLATURE,
RELATING TO THE

Milwaukee and Rock River Canal,

TOGETHER WITH THE OPINION
OF THE
ATTORNEY GENERAL,
IN 1848,
AND THE

REPORT
OF THE
COMMITTEE ON PUBLIC LANDS.
TO CONGRESS,
ON THE SAME SUBJECT, IN 1842.

Reprinted and Laid before Congress, 1858.

MILWAUKEE:
DAILY NEWS STEAM PRINTING ESTABLISHMENT, MARION STREET.
1858.

Panama canal
Documents, etc.

no. 36

X-TC 777

5

SOCIÉTÉ INTERNATIONALE

D'OBTENTION DE CONCESSION

DE

CANAL COLOMBIEN

DU PERCEMENT

DE

L'ISTHME AMÉRICAIN

PAR

M^{me} Clémence ROYER.

Extrait du JOURNAL DES ÉCONOMISTES

Numéros de ~~décembre~~ 1874 et janvier 1875.
Armand

PARIS

LIBRAIRIE DE GUILLAUMIN ET C^e, ÉDITEURS

du Journal des Économistes, des Économistes et Publicistes contemporains,
de la Bibliothèque des sciences morales et politiques, du Dictionnaire
de l'Économie politique, du Dictionnaire du Commerce et de la Navigation, etc., etc.

RUE RICHELIEU, 14.

1875

X-TC 7775 #3

Panama canal.
Documents, etc.

no. 35

F. J. Mount

X-TC 777

SOCIÉTÉ DE GÉOGRAPHIE

5

ET

COMMISSION DE GÉOGRAPHIE COMMERCIALE DE PARIS

SECTION FRANÇAISE

DU

COMITÉ INTERNATIONAL D'ÉTUDE

POUR L'EXPLORATION

DE

L'ISTHME AMÉRICAIN

EN VUE DU PERCEMENT D'UN CANAL INTEROcéanique

Bureaux à Paris, 9, rue Clary

PROCÈS-VERBAL DE LA SÉANCE DU 11 MAI 1876

EXTRAIT DU JOURNAL L'EXPLORATEUR

PARIS

AUX BUREAUX DE L'EXPLORATEUR

24 ET 26, PASSAGE COLBERT, 24 ET 26

1876

X-TC 777-5 #4

Examen critique d'un projet de
TUNNEL MARITIME

pour le
CANAL INTÉROCÉANIQUE
proposé par
PANAMA.

Profils comparatifs
du
Tunnel projeté

(4.500.000 mètres cubes en rocher dur)
avec tunnel de chemin
de fer à deux voies.

Echelle commune aux deux profils:

0^m 005 par m.

Niveau moyen des mers 24^m 00

9^m 825

X-TC 777.5#5

Panama canal.
Documents, etc.

no. 13 X: TC 777

X-TC 777.5 #6

15

LE
CANAL INTEROCÉANIQUE
DE
PANAMA

COUP D'ŒIL SUR LES TRACÉS MARITIMES
PROPOSÉS ENTRE L'ATLANTIQUE ET LE PACIFIQUE
A TRAVERS L'ISTHME AMÉRICAIN

LOUIS VERBRUGGHE

PARIS
A. QUANTIN, IMPRIMEUR
7, rue SAINT-BENOÎT, 7

1879

Panama canal.
Documents, etc.

no. 38

X-TC 777

• 5

X-TC 777.5 #7

★

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Prix : 50 centimes

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A PARIS, 20, RUE DU CROISSANT

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1879

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Panama canal.
Documents, etc.

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X-TC 777.5 #8

LA VÉRITÉ

SUR

LE CANAL INTEROCÉANIQUE

DE PANAMA

PAR

LUCIEN DE PUYDT

Ingenieur; Explorateur de l'Isthme américain; Agent général de la Société internationale d'études du Canal Colombien; Membre fondateur de la Société de Géographie de Madrid; Membre titulaire de la Société de Géographie de Paris; Correspondant des Sociétés royale de Géographie de Londres, de Marseille et de Bordeaux; Membre de la Société météorologique de France; Membre du Conseil de la Société des Etudes coloniales et maritimes, etc., etc.

La vérité est un phare qui brille
à tous les yeux; mais il faut
les ouvrir.

PARIS

CHARLES SCHILLER, IMPRIMEUR BREVETÉ

11, RUE DU FAUBOURG-MONTMARTRE, 11

1879

X-TC 777

Panama canal.
Documents, etc.

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no. 25

AMERICAN SOCIETY OF CIVIL ENGINEERS.

INSTITUTED 1852.

TRANSACTIONS.

NOTE.—This Society is not responsible, as a body, for the facts and opinions advanced in any of its publications.

(Vol. IX.—January, 1880.)

INTER-OCEANIC CANAL PROJECTS *

DISCUSSIONS

By WALTON W. EVANS, FREDERICK M. KELLEY, CHARLES A. SWEET, JOHN C. CAMPBELL, CHARLES D. WARD, N. APPLETON, S. F. SHELBOURNE, MAX E. SCHMIDT, THOMAS J. LONG and EDWARD P. NORTH.

Discussion by WALTON W. EVANS.

I beg to offer a few remarks in discussion of Mr. Menocal's paper on the much-vexed project of the Inter-Oceanic Canal. I wish to give, first, my reasons for venturing an opinion :

1st. I have served for seven years as an engineer in the construction of canals.

2d. I have had an experience in the construction of public works of over forty-two years.

3d. I have crossed the Isthmus many times—partly by foot, by mule, by canal, and by rail.

4th. I have been detained on the Isthmus for weeks—by rains, revolutions, and want of transportation—before the railway was built.

*Inter-Oceanic Canal Projects. A. G. MENOCAL, No. CLXXXVIII., Vol. VIII., page 311 (November, 1879.)

4
X: TC 777

5 #10

IV.—MISCELLANEOUS.

No. 24.

THE PROPOSED
AMERICAN INTER-OCEANIC CANAL

IN ITS

COMMERCIAL ASPECTS.

BY

JOSEPH NIMMO, Jr.,
CHIEF OF THE BUREAU OF STATISTICS.

TREASURY DEPARTMENT, AUGUST 7, 1880.

X · TC 777

Panama canal.

· 5 #11

Documents, etc.

no. 31

REVIEW
OF
THE PROPOSED
TEHUANTEPEC SHIP-RAILWAY.

JUNE 1, 1881.

GIBSON BROTHERS, PRINTERS.

Panama canal
Documents, etc.

no. 20

COMPAGNIE UNIVERSELLE DU CANAL INTEROCÉANIQUE

INAUGURATION

DU

PANORAMA DU CANAL DE PANAMA

28 SEPTEMBRE 1883

CONFÉRENCE DE M. DINGLER

Ingénieur en Chef des Ponts et Chaussées,

DIRECTEUR GÉNÉRAL DES TRAVAUX DU CANAL MARITIME



PARIS

Imprimerie de la Compagnie universelle du Canal maritime de Suez
9, RUE CHARRAS, 9

1883

Panama canal COLOMBIA.

Documents, etc

no 5

119

COLOMBIA.

X TC 771

• 5

No. 67.

Mr. Scruggs to Mr. Frelinghuysen.

No. 125.]

LEGATION OF THE UNITED STATES,
Bogota, November 30, 1883. (Received January 3, 1884.)

SIR: Although the work of cutting the Panama Canal was commenced nearly three years ago, and has been extended throughout almost its entire length, yet the most important practical question connected with the enterprise has during all this time been left undecided. I allude, of course, to the question of locks.

At the International Canal Congress held in Paris in May, 1879, it was shown by American and English engineers who had made the matter a subject of special and careful study that the opening of a maritime water-way across the Isthmus of Panama without locks and parallel sluices would be an impossibility. Nevertheless, Messrs. Wyse and de Lesseps, who had never surveyed the route, but who held an exclusive "concession" from the Colombian Government, reiterated their purpose to open a canal from Colon to Panama *à niveau*, "without locks or hindrances of any kind." And since the "congress" had been called merely to ratify what these distinguished gentlemen and their associates had already agreed upon, their "plan" was finally adopted, amid much confusion, by a vote of 72 against 61.

It now turns out, however, despite the confident and oft-repeated assertions of M. de Lesseps to the contrary, that at least two locks will be necessary; and that, in addition, there will have to be parallel canals for the reception of the waters of the Chagres and other rivers, which range all the way from 42 to 78 feet above the sea-level, thus augmenting the original cost of the canal by nearly one-third.

These facts are reluctantly set forth in the recent report of Mr. Dingler, the chief engineer of the Panama Canal Company. I regret my inability to send you a copy of this important report. It is destined to have a marked influence upon the fortunes of the shareholders. I, however, transmit herewith a full synopsis of it, which I find in the London Standard of the 9th of October last.

I have, &c.,

WILLIAM L. SCRUGGS.

[Inclosure in No. 125.—From the London Standard, October 9, 1883.]

THE PANAMA CANAL.

[From our correspondent.]

PARIS, Monday night.

M. Dingler, the chief engineer of the Panama Canal Company, has just laid a report before the superior works committee which is of great interest to international commerce. Though the work of cutting the canal has been commenced throughout almost its entire length, yet several of the most important questions concerning the creation of the maritime water-way across the Isthmus of Panama had been left undecided. The report I now have before me, and which I have had some trouble to

Panama canal
Documents, etc.

X-TC 777

no. 37 : 5 #4

THE
TEHUANTEPEC SHIP RAILWAY,

BY

E. L. CORTHELL, C.E.

[AN ADDRESS DELIVERED BEFORE THE FRANKLIN INSTITUTE, DECEMBER 28, 1884.]

"MERRIEN PRINT" (J. SCENER SMITH, 501 CHESTNUT ST., PHILA.

Remains on
I remember, to

no. 26

X-TC 777

• 5 #15

in Oversize Box #27

THE PANAMA SHIP CANAL.

The mission of our Special Artist, Mr. Melton Prior, - Across Two Themes - the Atlantic and the Pacific - is to show the world how he can see most interesting to our readers, from the West Indies and from the shores of California and British Columbia, to Alaska and to the Isthmus of Panama. There, indeed, with a view to the immediate step, hitherto forbidden to navigation, but which would give us a new way of crossing the ocean, we take to readers possible in traversing both oceans without interruption, he was directed to visit the maritime world, and to make the sketches now published, the first that have yet appeared in any journal or book, since the commencement of the century.

In giving to the best of our information, a just and correct account of this huge undertaking, we shall refrain from expressing any opinion as to the wisdom or the financial prospects, which concern a very large number of French shareholders, for whose sake we shall continue to hope that it may, at some future date, be a profitable investment. How many years, labour, how many millions sterling of expenditure, it will yet cost, we do not pretend to know, and we do not pretend to know that the world in general, England and the British colonies in particular, will ultimately derive immense advantage from the completion of the work, and it is not unlikely that the further delay of a few years in the completion may have beneficial to some part of the world.



M. FERDINAND DE LESSEPS.

Great Britain, will be of much commercial importance, as the freight charges and risks, especially of tropical and equatorial regions, will be lessened. India will probably not be greatly affected by the new route of navigation; and it may be doubted whether it will be of much advantage to China and Japan, the Canadian Pacific Railway, must certainly be more expeditious than the route of navigation through the Isthmus of Panama. The Panamanian and Oriental route to India and Eastern Asia, however, should hold its own against every competition, and it would therefore, be with a short-sighted view of our own interests, and it would show a capricious, partial, and ungenerous policy, to refuse to open up the route of the civilised world, at least with the rest of Europe, in a frank recognition of the extraordinary merits and services of the French enterprise.

M. Ferdinand de Lesseps, the successful projector and constructor of the Suez Canal, the founder of the Panama Canal Company, and hitherto its active director, is the "great old man," this wonderful octogenarian, who has fought so many pacific and beneficent battles for purposes most useful to all and gains for practical business are still unclouded by a multiplicity of false negotiations and speculations, and he is a champion of advancing commerce.

In the second volume of his autobiographical memoirs, "Recollections of Forty Years," now published by Messrs. Smith, Elder, & Co., the author, with the same accuracy and the same unimpaired ability, the circumstances attending the construction of the present great work; one that he may great

X TC 777

INVESTIGATION OF PANAMA CANAL, 5 #16

MARCH 3, 1893.—Laid on the table and ordered to be printed.

Mr. FELLOWS, from the Special Committee to Investigate the Panama Canal Company, etc., submitted the following

REPORT:

The Committee on Rules, to whom were referred the resolutions heretofore introduced by Mr. Fellows and Mr. Geary, respectively, reported the same back with the recommendation that the resolution herewith submitted be adopted in lieu thereof, viz:

Resolved, That a special committee of five be appointed by the Speaker to investigate and report as to what sums of money, if any, were expended by the Panama Canal Company, or its promoters, directly or indirectly, for the purpose of preventing opposition in this country to the plans of said company, or securing acquiescence in America thereto, and what disposition was made of such sums; and generally as to the situation of affairs upon the Isthmus so far as American commerce seeking transit across the same may be concerned; and also as to the contracts and relations between the Pacific Mail Steamship Company and the Southern Pacific Railroad Company, the Transcontinental Railroad Association, and other railroads; and as to what contracts or other collusive arrangements have been made by said companies whereby the traffic by way of the Isthmus of Panama has been suppressed or diminished; and as to whether said steamship company, by virtue of said contracts or otherwise, has been practically absorbed by or subjected to the control of said railroad companies; and as to whether the business which it was the design of this Government to foster by the sums granted to said steamship company, through mail contracts or otherwise, has been thereby diverted from the Isthmus of Panama and the Panama Railroad Company to such transcontinental companies; and as to whether such acts are detrimental to the interests of American maritime commerce and the producers, manufacturers, and merchants of the United States; and if such abuses are found to exist, by what means the same can or should be suppressed, and as to whether the further grant of said sums to said steamship company should be withdrawn. Said committee shall have the power to send for persons and papers and administer oaths, and the expenses incurred in said investigation shall be paid out of the contingent fund of the House, and said committee shall have leave to sit during the sessions of the House in Washington or elsewhere.

Your committee, to which was referred the foregoing resolution, finds itself confronted with the fact that this session will close within a few days and that some report is demanded during the very last week of an expiring Congress.

The matters referred to in the resolution are so varied and distinct in their nature that while the committee finds itself able authoritatively to report on certain of the subjects contained in it, feeling confident that the true facts have been thoroughly disclosed, as to other matters referred your committee does not feel that same confidence, and should the House desire further investigation of some of the subjects embraced in this resolution your committee does not feel justified in saying that no ground for such action exists. Your committee has not felt itself compelled to go through the great mass of diplomatic papers and correspondence which has accumulated during the pres-

Panama
Documents, etc.

X-TC 777

no. 22 . 5 #17

Seventy-Eighth Year. Tros Tyrusque mihi nullo discrimine agetur.

Vol. 156: No.

THE NORTH AMERICAN REVIEW.

Re-established by ALLEN THORNDIKE RICE.

EDITED BY LLOYD BRYCE.

February, 1893.

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PARIS: BAZZANO'S, 17 Avenue de l'Opéra. GENEVA: J. CHERRULIER. ROME: LÖSCHER & Co.
MELBOURNE, SYDNEY, AND ADELAIDE: George ROBERTSON & Co.
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Per Annum, \$5.

Panama Canal
Documents, etc.
56TH CONGRESS,
1st Session. SENATE.

no. 11

DOCUMENT
No. 188.

X: TC 777

5 #18

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W PANAMA CANAL COMPANY OF FRANCE.

MESSAGE

FROM THE

PRESIDENT OF THE UNITED STATES,

TRANSMITTING,

RESPONSE TO RESOLUTION OF THE SENATE OF JANUARY 23,
1900, COPIES OF THE COMMUNICATIONS RECEIVED BY THE
PRESIDENT AND BY THE SECRETARY OF STATE FROM THE NEW
PANAMA CANAL COMPANY OF FRANCE.

FEBRUARY 20, 1900.—Read, referred to the Committee on Inter-oceanic Canals,
and ordered to be printed.

To the Senate:

I transmit herewith, in response to the resolution of the Senate of
January 23, 1900, copies of the communications received by the Presi-
dent and by the Secretary of State from the New Panama Canal Com-
pany of France, or any of its officers or attorneys.

WILLIAM MCKINLEY.

EXECUTIVE MANSION,
Washington, February 20, 1900.

To the PRESIDENT:

The undersigned, the Secretary of State, to whom was referred the
resolution of the Senate of January 23, 1900, requesting the President
"to furnish the Senate, if in his opinion it is not incompatible with
the public interest, copies of all correspondence and communications
received by him, or by the Secretary of State, from the New Panama
Canal Company of France, or any of its officers or attorneys," has
the honor to transmit herewith the papers called for.

Respectfully submitted.

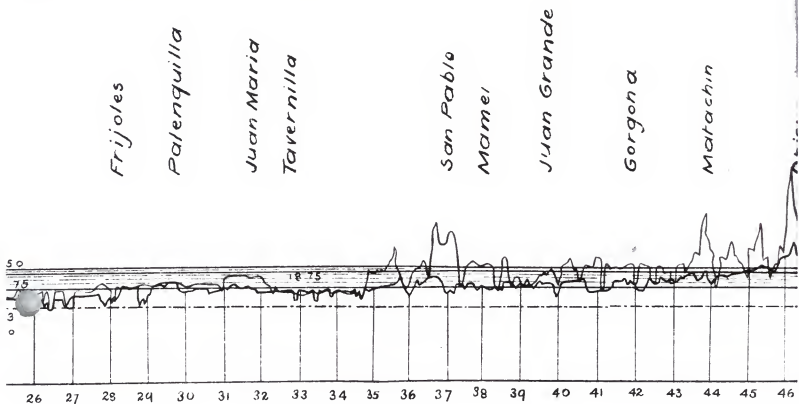
JOHN HAY.

DEPARTMENT OF STATE,
Washington, February 19, 1900.

26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46

#6. *Plan No. 2*
Sea Level Box = 21

Low level dividing Lock System (Bottom Elevation 9.75 m.)



PLAN OF THE NEW PANAMA CANAL

Plan No. 2 (Elevation 20.75) with four Locks on each side of the divide is the one which has been approved by the International Technical Commission but it is possible that in course of construction the number of Locks may be reduced to two on each side as in Plan No. 3. There is nothing in the Physical Conditions to prevent a change from Locks to a Sea-Level Canal should the latter, in the future, seem desirable.

Panama canal.
Documents, etc.

no. 7

56TH CONGRESS,
1st Session

SENATE.

{ DOCUMENT
No. 389.

X TC 777

5 #19

SHIP CANALS IN THE ISTHMUS OF DARIEN.

MAY 21, 1900.—Ordered to be printed.

Mr. MORGAN presented the following

SUPPLEMENTARY REPORT FROM THE COMMITTEE ON INTER-OCEANIC CANALS, TO ACCOMPANY THE BILL (H. R. 2538) "TO PROVIDE FOR THE CONSTRUCTION OF A CANAL CONNECTING THE WATERS OF THE ATLANTIC AND PACIFIC OCEANS," AND ALSO CERTIFIED COPIES OF THREE ACTS OF THE LEGISLATURE OF NEW JERSEY.

The Committee on Interoceanic Canals report the following certified copies of charters of corporations of New Jersey relating to ship canals in the Isthmus of Darien, and request that the same be printed as a document for the use of the Senate :

CERTIFICATE OF INCORPORATION OF PANAMA CANAL COMPANY OF AMERICA.

UNITED STATES OF AMERICA, *State of New Jersey*:

We, the undersigned, hereby do associate ourselves into a corporation, under and by virtue of the provisions of an act of the legislature of the State of New Jersey, entitled "An act concerning corporations (revision of 1896)," and the several acts amendatory thereof and supplemental thereto, for the purposes hereinafter named, and do make this our certificate of incorporation.

First. The name of the corporation is Panama Canal Company of America.

Second. The location of the principal office of the corporation in the State of New Jersey is at 76 Montgomery street, in Jersey City, in the county of Hudson, and the name of the agent therein and in charge thereof, upon whom process against this corporation may be served, is William Brinkerhoff.

Third. The objects for which the corporation is formed are as follows:

To acquire, by purchase or otherwise, the maritime ship canal of the Compagnie Nouvelle du Canal de Panama and the railway across the Isthmus of Panama between the Atlantic Ocean and the Pacific Ocean; to construct, exploit, complete, equip, repair, and enlarge; to operate, manage, maintain, and control said canal and railway and the various

X-1C 777

5 #20

Panama canal
Documents, etc.

no. 30

AMERICAN SOCIETY
OF
CIVIL ENGINEERS.

THE BOHIO DAM.

BY

GEORGE S. MORISON, Past-President, Am. Soc. C. E.

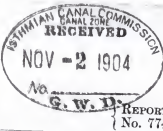
WITH DISCUSSION BY

**MESSERS. FREDERIC P. STEARNS, ALLEN HAZEN, EDWARD P.
NORTH, BOYD EHLE, THEODORE PASCHKE, WILLIAM
H. BURR, A. G. MENOCAL, H. N. PHARR, EDWIN
DURYEA, JR., C. A. SUNDSTROM, EDWARD
WEGMANN, PHILIPP FORCHHEIMER,
J. L. CAMPBELL, J. T. FORD AND
GEORGE S. MORISON.**

Reprinted from Transactions, Vol. XLVIII, page 235 (1908).

Panama canal.
Documents, etc.

no. 6



57TH CONGRESS, }
1st Session. }

SENATE.

REPORT
No. 774.

X TC 777 #21
PROPOSED CANAL ACROSS THE ISTHMUS AT SAN
BLAS, ETC.

MARCH 17, 1902.—Ordered to be printed.

Mr. HARRIS, from the Committee on Interoceanic Canals, submitted
the following

REPORT.

[To accompany S. R. 45.]

The Committee on Interoceanic Canals reports Senate Joint Resolution No. 45 adversely, and recommends that it be indefinitely postponed. The grounds on which this report rests are stated in the report of the subcommittee to the general committee, which was adopted by that committee, as follows:

"REPORT OF SUBCOMMITTEE TO FULL COMMITTEE.

"The committee to whom was referred Senate Joint Resolution No. 45 and the matter of hearings as to the proposed canal across the Isthmus at San Blas via the Mandinga River beg leave to submit the following report:

"It is evident to your committee that all of this region between Panama and the mainland is covered by the concession now held by the Panama Canal Company. Hence any operations in this region must be by and with the consent of the canal company, assented to by the Colombian Government. No such permission or right has been obtained by any of the parties interested in the route.

"In fact, the whole testimony in regard to the proposed line shows it to be a mere supposition, based upon a preliminary survey made in 1864 under the auspices of Mr. Fred. W. Kelley, of New York. Even the lines of the original survey are in places wholly changed and abandoned and another line drawn on the map without any data whatever to give the least color to the assertions made with regard to it. The conclusions arrived at by these gentlemen are wholly controverted by the report of the Isthmian Canal Commission, and in the evidence given by these gentlemen and other engineers and persons familiar with the country.

Panama canal
Documents, etc

General Davis
with reports of the Author.
no. 41

X TC 777

: 5

X-TC 777.5 #22

The Panama Canal

as involving the

Regulation of the Chagres River

By

GEN. HENRY L. ABBOT

Colonel Corps of Engineers, Retired,
and Member of
The International Technical Commission



Reprinted from
THE ENGINEERING MAGAZINE
New York—London
December, 1902

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Panama canal
Documents, etc.

General Davis

with subjects of the author

no. 23

X-TC 777

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VOL. XXV.

JUNE, 1903.

No. 3.

THE PANAMA CANAL: THE DUAL VERSUS THE SINGLE-LAKE PROJECT.

By Gen. Henry L. Abbot. With reply by George S. Morison.

General Abbot and Mr. Morison are not only engineers of pre-eminent distinction and international reputation, but the leading advocates of the two great projects for the Isthmian Canal. The following papers are supplementary to their more extended discussion of the question in this Magazine for December, 1902, and January, 1903. They are brief summaries of the essential points of the respective plans. It is unnecessary to do more by way of introduction than to call attention to the interest and importance of this finished debate by two of the world's highest authorities.—THE EDITORS.

IN Mr. Morison's paper which appeared in the January number of THE ENGINEERING MAGAZINE, and in a second which is printed in the proceedings of the American Society of Civil Engineers for the same month, he proposes to modify radically the plan adopted by the Isthmian Canal Commission, of which he was a member, not only in the mode of construction of the Bohio dam but also by abandoning about six miles of canal now largely excavated, below Bohio, and adopting a new location, much of it raised above the general level of the country, and involving three crossings of the bed of the Chagres river as well as an additional lock at Tiger Hill. It would seem therefore that there are three plans for the canal to be considered, which in order of date are: that of the International Commission of Engineers, known as the *Comité Technique*, that of the Isthmian Canal Commission, and that of Mr. Morison. The fundamental difference between them consists in the fact that by the first the regulation of the Chagres river is effected by two lakes, one of them created by a dam at Alhajuela and the other by a dam at Bohio, while by the other two plans only one lake is projected, at Bohio, but which is much larger

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*Panama canal
Documents, etc.*

no. 45

X-TC 777

5

X-TC 777.5 #24

COMPAGNIE NOUVELLE
DU
CANAL DE PANAMA

SOCIÉTÉ ANONYME

Au capital de 65 millions de francs

SIÈGE SOCIAL : 7, RUE LOUIS-LE-GRAND, PARIS

Assemblée Générale Extraordinaire

du 23 Avril 1904

RAPPORT DU CONSEIL D'ADMINISTRATION

PARIS

SOCIÉTÉ ANONYME DE PUBLICATIONS PÉRIODIQUES
43, QUAI VOLTAIRE, 43

1904

Panama canal
Documents, etc

no. 48

x-TC 777

: 5

Major General George W. Davis

with projects of the author.

#25

DISPOSITION OF RAINFALL IN THE BASIN OF THE CHAGRES.

By

GEN. H. L. ABBOT, U. S. A., (RETIRED.)

Reprinted from the Monthly Weather Review for February, 1904.

Panama canal.

Documents, etc.

no. 47

General George W. Davis

X-TC 117

with aspects of the author

26

HOURLY CLIMATIC RECORDS ON THE ISTHMUS OF PANAMA.

By

GEN. H. L. ABBOT, U. S. A. (RETIRED.)

Reprinted from the Monthly Weather Review for June, 1904.

Vol. XL.

APRIL, 1904.

No. 4

X-TC 777

: 5 #27

AMERICAN SOCIETY OF CIVIL ENGINEERS.

INSTITUTED 1852.

PAPERS AND DISCUSSIONS.

This Society is not responsible, as a body, for the facts and opinions advanced
in any of its publications.

THE GATUN DAM.

By C. D. WARD, M. Am. Soc. C. E.

To BE PRESENTED MAY 18TH, 1904.

In a paper,* entitled "Inter-Oceanic Canal Projects," by A. G.

* *Transactions, Am. Soc. C. E., 1879, Vol. VIII, p. 311.*

Menocal, M. Am. Soc. C. E., it is stated that the Government Commission, appointed in 1875, reported, as to a canal with locks, from Colon to Panama, as follows:

"The river (Chagres) is proposed to be crossed by means of an aqueduct having twelve spans of 90 ft. each, 1 900 ft. extreme length, 65 ft. wide and 26 ft. deep."

In discussing this paper,† the late Ashbel Welch, Past-President,

† *Transactions, Am. Soc. C. E., 1889, Vol. IX, p. 148.*

Am. Soc. C. E., a thorough and noted canal engineer in his day, said:

"The first thought of an American canal and river engineer, on looking at M. de Lesseps' raised map, is to convert the valley of the lower Chagres into an artificial lake, some 20 miles long, by a dam across the valley at or near the point where the proposed canal strikes it a few miles from Colon, such as was advocated by Mr. C. D. Ward."

The site proposed for this dam was at Gatun, 7.5 miles from deep water at Colon, the end of the canal. But, as is well known, the use of locks was not to be thought of under M. de Lesseps' domination, and a sea-level canal was commenced in 1883.

Property of the United States Senate.

CONFIDENTIAL.

55TH CONGRESS,
2d Session.

CONFIDENTIAL
CONFIDENTIAL EXECUTIVE II.

Do not leave this where it
be SEEN.
CORRESPONDENCE RELATING TO THE PANAMA CANAL.

MESSAGE

FROM THE

PRESIDENT OF THE UNITED STATES,

TRANSMITTING

THE CORRESPONDENCE RELATING TO THE PANAMA CANAL
CALLED FOR BY THE RESOLUTION OF THE SENATE OF JANU-
ARY 29, 1904, IN LEGISLATIVE SESSION.

FEBRUARY 4, 1904.—Ordered to lie on the table.

FEBRUARY 11, 1904.—Referred to the Committee on Foreign Relations and ordered
to be printed in confidence for the use of the Senate.

To the Senate:

In response to the resolution of the Senate of January 29, 1904,
requesting the President

to inform the Senate whether all the correspondence and notes between the Depart-
ment of State and the Government of the United States at Bogota, and between either of
these and the Government of Colombia, in relation to the construction of an isthmian
canal since June 28, 1902, and all the correspondence and notes between any Depart-
ment of the Government of the United States and any of its officials or representa-
tives or the Government of Panama, concerning the separation of Panama from
Colombia, have been sent to the Senate, and if not, that he be requested to send the
main body of correspondence and notes to the Senate in executive session, if not, in his
judgment, incompatible with the public interest.

I transmit herewith a report, by the Acting Secretary of State, fur-
nishing all such correspondence in the Department of State as has not
already been communicated to the Senate and printed in Senate Docu-
ments Nos. 51, 53, and 55.

Panama canal
Documents, etc

X-TC 777

no. 345 #79

ISTHMIAN CANAL ZONE

== Laws and ==

Regulations Governing

THE

== Police Force ==

PANAMA
ISTHMIAN CANAL COMMISSION PRESS, 110
1904

(over)

Over size
Box #21

FRONTIER

Print

TOTAL.

HONORARY

83

ARRESTS MADE DURING

OFFENSES.

Chief	4	exhibiting vice
People	5	about; and getting
Attendants	2	about; and getting
Travellers	4	about; and getting
Chapman	4	about; and getting
Police squads	5	about; and getting
Prostitute	6	about; and getting

[illegible]

*Panama canal
Documents, etc.*

no. 9

ISTHMIAN CANAL.

X TC 777

5 # 80

MESSAGE

FROM THE

PRESIDENT OF THE UNITED STATES

TRANSMITTING

A STATEMENT OF ACTION IN EXECUTING THE ACT
ENTITLED "AN ACT TO PROVIDE FOR THE CON-
STRUCTION OF A CANAL CONNECTING THE
WATERS OF THE ATLANTIC AND PACIFIC
OCEANS," APPROVED JUNE 28, 1903.

WASHINGTON:

GOVERNMENT PRINTING OFFICE.

1904.

#31

General A. Davis
with Compliments of the author

REGIMEN OF THE CHAGRES

X-TC 772

5

BY

GENERAL HENRY L. ABBOT

*Colonel Corps of Engineers, Retired. Late Member, International
Technical Commission*

Reprinted from HARVARD ENGINEERING JOURNAL, June, 1904

Major J. V. Abbot
Panama canal. *from his former*
Documents, etc. *no. 33*

X-TC 777
5 #32
The Solution
of the
Isthmian Canal Problem

By Gen. Henry L. Abbot

Major Abbot.



LC

Reprinted from
THE ENGINEERING MAGAZINE
JANUARY, 1904

Panama canal.
Documents, etc.

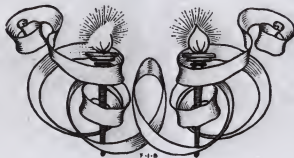
General G. W. Davis
no. 40
With Poughkeepsie of Doctor

X-TC 777
• 5 #53

The Revival of the Sea-Level Plan for the Panama Canal

By Gen. Henry L. Abbot

Colonel, Corps of Engineers, and Brigadier General, U. S. A.,
Retired. Late Member International Technical Commission.



Reprinted from
THE ENGINEERING MAGAZINE
FEBRUARY, 1905

Panama canal.
Documents, etc.

no. 16

X-TC 777

i 5 #34

PANAMA CANAL.

SPEECH

OF

HON. ALBERT J. HOPKINS,
OF ILLINOIS,

IN THE

SENATE OF THE UNITED STATES,

Friday, June 8, 1906.

*

WASHINGTON.
1906.

Panama canal.
Documents, etc.

59TH CONGRESS, }
1st Session. }

SENATE.

no. 3

{ DOCUMENT
No. 456.

X TC 777

5 #35

TYPE OF CANAL TO BE CONSTRUCTED AT PANAMA.

Mr. MORGAN presented the following

**LETTER FROM MR. C. HENRY HUNTER, CHIEF ENGINEER
MANCHESTER SHIP CANAL, OF MANCHESTER, ENGLAND,
ADDRESSED TO HON. A. B. KITTREDGE, RELATING TO THE TYPE
OF CANAL TO BE CONSTRUCTED AT PANAMA.**

MAY 24, 1906.—Referred to the Committee on Inter-oceanic Canals and ordered to be printed.

OAKHURST, ECCLES OLD ROAD,
Manchester, April 28, 1906.

SIR: I have the honor to refer further to your letter of the 11th instant and to reply thereto as follows:

As a member of the Board of Consulting Engineers I took part in the exhaustive investigation into the merits and demerits of the various types of canal proposed for the inter-oceanic waterway on the Panama line, and consequently became convinced that it was my duty to support the proposal for the construction of a canal at sea level and to subscribe to the recommendation to the United States Government and to Congress as to the adoption of the sea-level type of canal.

A careful study of the report presented by a minority of the members of the board has confirmed me in the opinion which I formed.

After considerable experience, not only in the construction but also in the operation of maritime waterways, it appears to me to be clear that the paramount consideration in the discussion as to the type of the Panama Canal should be the provision of a waterway which will, so far as human effort can secure such a result, be absolutely safe as a navigation, and therefore shall not present any peculiar hazards to the traffic, and shall not include any inherent features which may make for disaster to vessels in transit and for the destruction of the works when completed.

I venture respectfully to hope that the Senators who are engaged in the present inquiry will agree with this proposition.

Safety of navigation requires (1) that the canal shall be free from obstruction, and (2) that it shall not be dependent for its existence upon the maintenance and preservation of works of art of an experimental character.

It is impossible to deny that the employment of locks of great size, and particularly of lifts of height beyond all precedent in engineering

Panama canal.

Documents, etc.

no. 8

59TH CONGRESS, {
1st Session. }

SENATE.

{ DOCUMENT
No. 456. }

X-TC 777 #36

TYPE OF CANAL TO BE CONSTRUCTED AT PANAMA.

Mr. MORGAN presented the following

**LETTER FROM MR. C. HENRY HUNTER, CHIEF ENGINEER
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No. 2827. VOL. LV. JAN. 25, 1907.

PUBLISHED
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FRIDAY.

JOURNAL^{of the} SOCIETY OF ARTS

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Panama canal for G. W. Davis
Documents, etc. no. 43 *Copy sent to author*

X-TC 777

5

PUBLICATION OF
THE AMERICAN ACADEMY OF POLITICAL AND SOCIAL SCIENCE

Present Status of the Panama Project

BY

BRIGADIER-GENERAL HENRY L. ABBOT, U. S. A., Retired

Late Member of the Comité Technique, sometime Consulting Engineer of the New Panama
Canal Company, and late Member of the U. S. Board of Consulting Engineers

Reprinted from THE ANNALS of the American Academy of Political
and Social Science for January, 1908

PHILADELPHIA
THE AMERICAN ACADEMY OF POLITICAL AND SOCIAL SCIENCE

Panama canal.
Documents, etc.

no 2

no. 1 X TC 777

6 #39
EXECUTIVE
N.

60TH CONGRESS, {
2d Session. }

CONFIDENTIAL.

TREATIES WITH PANAMA AND COLOMBIA RELATING TO
THE PANAMA CANAL.

MESSAGE

FROM THE

PRESIDENT OF THE UNITED STATES,

TRANSMITTING

TREATIES BETWEEN THE UNITED STATES AND THE REPUBLICS
OF PANAMA AND COLOMBIA RELATING TO THE PANAMA
CANAL, BOTH SIGNED ON JANUARY 9, 1909.

JANUARY 11, 1909.—Read; treaties read the first time and referred to the Committee
on Foreign Relations, and, together with the message and accompanying papers,
ordered to be printed in confidence for the use of the Senate.

The PRESIDENT:

I have the honor to submit herewith, with a view to their transmission to the Senate to receive the advice and consent of that body to ratification, a treaty between the United States and the Republic of Panama and a treaty between the United States and the Republic of Colombia, both signed on January 9, 1909.

I transmit also, for your information and that of the Senate, a copy of treaty between the Republic of Colombia and the Republic of Panama, concluded at the same time, the three treaties being in effect parts of the same transaction whereby peace is established between Panama and Colombia, the separation of the two Republics is agreed to, and the relations incident to the separation are adjusted.

Respectfully submitted.

ELIHU ROOT.

DEPARTMENT OF STATE,
Washington, January 11, 1909.

100

Panama Canal
Panama, etc.
no. 15
X-TC 777
5

A LECTURE ON THE INTER-OCEAN PANAMA CANAL

(RETROSPECT)

**Historical, Political, Geographical, Commercial and
Technical Essay.**

**Comparison between the French and American
control of the canal work.**

Written and compiled by ADOLPHUS E. VERDEREAU, ESQ.
Respectfully dedicated to the American People.

Published under the immediate patronage of Sr. LADISLAV
SOSA, Ex-Secretary of Public Works of the
Republic of Panama.

(VIRES ACQUIRIT EUNDO.)

Copyright and translation reserved by the author.

Printed at ISTHMIAN Printing Office, in Panama.

-1909-

PRICE: 50 Cents U. S. Cy.

A Sea-Level Canal at Panama—A Study of Its Desirability and Feasibility.

BY HENRY G. GRANGER, CARTAGENA, COLOMBIA, S. A.

(New Haven Meeting, February, 1909.)

Nothing in this paper is to be understood as even suggesting a moment's suspension of the splendid work now going forward on the Isthmus of Panama, except so far as it is related to the proposed locks. All the work already done, and all material purchased or ordered, would be available for the plan herein proposed. The situation and the problem concerned may be summarized as follows: The scheme of a lock-canal through the Isthmus of Panama was adopted, as is well known, on two principal grounds—namely, the greater expense of a sea-level canal, and the longer time required for its construction. Of these, the latter is believed to have been the more influential. But further developments have diminished the weight of both, so that a reconsideration of the question is warranted. It is the purpose of this paper to advocate such a reconsideration—emphasizing the importance of certain objections to the lock-canal not mentioned or not duly appreciated in the report of those members of the International Board of Consulting Engineers who favored this form; showing the nature and bearing of the new facts developed; and, finally, proposing a combination of well-known methods and apparatus, which would, in my judgment, effect the construction of a sea-level canal in less time, and perhaps at no greater cost, than will be required for the remaining work on the lock-canal.

I. OBJECTIONS TO A LOCK-CANAL.

1. *Earthquakes.*

Two centuries ago Panama is said to have been destroyed by an earthquake. In 1882 a rather violent earthquake was felt at the southern end of the Isthmus. In 1898 I felt a slight shock near the present border-line of Colombia. In 1900 I felt three shocks at Quibdo, the head of navigation of the

X TC 777

BEST TYPE OF CANAL FOR PANAMA

MARCH 26, 1909.—Ordered printed, with illustrations.

[Editorial in Engineering News, February 25, 1909.]

THE REASONS WHY THE LOCK PLAN FOR THE PANAMA CANAL IS PREFERABLE TO THE SEA-LEVEL PLAN.

Three years ago, after long and careful investigation, the United States Government decided upon the lock plan of construction for the Panama Canal. This decision was made in conformity with the weight of the best engineering opinion.

We say this advisedly and with all due respect to the engineers on the International Board who, at that time, from such knowledge as was then available, favored the sea-level plan. Secretary Taft and President Roosevelt, in making the final momentous decision in favor of the lock-canal plan, accepted the opinion of such leaders of the engineering profession as Alfred Noble and Gen. Henry L. Abbot, who had given more thorough study to the Isthmian Canal problem than any engineers in this country or elsewhere; of Mr. F. P. Sterns, whose eminence in the field of hydraulic engineering is well known to every member of the profession; of Mr. Joseph M. Ripley, with his long experience at the Soo Canal and its great lock, by far the greatest canal in point of traffic and by far the greatest lock in size, to be found in the world; of Mr. Isham Randolph, the engineering creator of the Chicago Drainage Canal, which ranks with the greatest canals on the globe.

Besides these engineers, the lock-canal plan was supported at that time by the engineers of the Isthmian Canal Commission, Gen. Peter C. Hains, Col. O. H. Ernst, and B. M. Harrod, past-president of the American Society of Civil Engineers. It also received the emphatic indorsement of Mr. John F. Stevens, then chief engineer of the canal work, and familiar, from close personal contact, with the problems involved in the question as to the relative merits of the two types.

We repeat, therefore, that Secretary Taft and President Roosevelt, in making the final momentous decision in favor of the lock canal plan three years ago, acted according to the best advice of the American engineering profession.

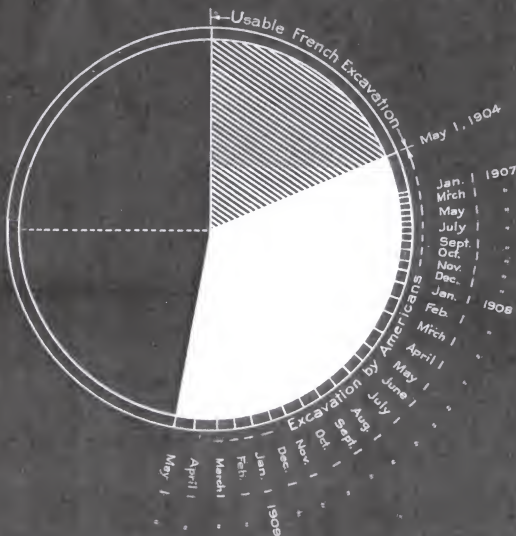
From that time to the present, we believe, the canal enterprise and the plan on which it is being carried out has deserved and has, we believe, received the general support and approval of American engineers.

It is now nearly three years since the decision in favor of the lock plan was made, and those three years have witnessed progress in construction exceeding the most sanguine expectations then entertained. The engineers on the Isthmus, in personal contact with the

5-7-3

Attachment
#42

sthmian Canal Commission. PANAMA CANAL EXCAVATION



French excavation usable in present plan.	40,000,000
Estimated amount of excavation required May 1, 04.	<u>174,666,595</u>
Total amount of excavation to complete Canal	<u>214,666,595</u>
Amount taken out by French prior to May 1, 04.	40,000,000
Amount taken out by Americans to May 1, 09.	<u>73,124,849</u>
Total excavation to May 1, 1909	<u>113,124,849</u>
Remaining excavation to be done	<u>101,541,746</u>

Panama canal
Documents, etc.

X-TC 777

no. 44

: 5

X-TC 777.5 #43

FORTIFICATIONS AT PANAMA

BY

GEORGE W. DAVIS

REPRINTED FROM
THE AMERICAN JOURNAL OF INTERNATIONAL LAW
OCTOBER, 1909

With the compliments of the
author Philippe Bunau-Varilla

Panama canal

Documents, etc.

no. 42

X-TC 777

5

X-TC 777.5 #441

THE TEXT OF A LECTURE BEFORE THE
COMMERCIAL CLUB OF BOSTON,

BY

PHILIPPE BUNAU-VARILLA,

ON THE

PANAMA CANAL.

(25th of February, 1909).

Reprinted from Congressional Record, Sixtieth Congress, Second Session,
Senate, Tuesday, March 2, 1909.

The Text of this lecture was introduced by Mr. Foraker, Senator from Ohio,
during a speech of Mr. Teller, Senator from Colorado, on the
Panama Canal. Mr. Foraker moved that it should
be printed in the Record and also
printed as a Senate document.

The Senate so ordered.

(see over.)

The text of the lecture before the Commercial Club of Boston is followed
by a supplement bearing on some important points which were to form part
of the lecture, but which had to be omitted for lack of time. Also, a third
chapter has been appended. It is formed by extracts from testimonies given
at Ancón, Canal Zone, before the Congressional Committee on Interstate and
Foreign Commerce, in which facts of the highest importance are set forth.
They form, so to say, a corroborative evidence of the statements made in the
lecture.

LA LUMIÈRE

SLR

MONSIEUR DE LESSEPS

SON CANAL DE SUEZ

son projet du Canal interocéanique

DE PANAMA

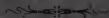
ET

UN MOT SUR LE PROJET

DU CANAL DE NICARAGUA

PAR

JR. WENMAEKERS.



DECOQ & D'HENT. ÉDITEURS
rue de la Madeleine, 9. BRUXELLES.

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Panama canal
Documents, etc.

no. 12 X - TC 777

: 5 #46

SUPPLEMENTAL REPORT

OF

MAJOR-GENERAL GEORGE W. DAVIS, U. S. A. (Retired),
GOVERNOR OF THE CANAL ZONE.

TELEGRAPHS.

The public, wishing to send messages by telegraph across the Isthmus, or from or to intermediate points, have the means of doing so by using the Panama Railroad telegraph, and paying the customary tolls for the service; but the rates charged by the railroad company are far and way beyond what should be charged. The rate from Panama to Colon, and vice versa, and from Ancon to Cristobal and vice versa, is \$1 for 10 words, address and signature being both counted, whereas in the United States 10 words would be sent over a distance of 250 miles for 25 cents, without counting address or signature.

When the work is being carried on rapidly, as it must be, to insure the completion of the canal in the time set for its completion, the telegraph and telephone service on the Isthmus must be very active, and as no private line now exists, and, in the opinion of the undersigned, none ought to exist within the Zone, the railroad across the Isthmus ought to be treated just as the Panama Railroad is recommended to be treated; that is, as a Government line, incidentally performing some service for the public, which the public should pay for at a fair rate. Not that the Government desires to handle the private business; it is submitted that it would be much more preferable to have nothing to do with it; but the establishment of a local telephone and telegraph line here would be objectionable in many ways, and it therefore follows that if the public are to have use of the telegraph or telephone, they must make use of the Government line.

The Isthmus is connected with the outside world by two systems of cable communication; one is the Central and South American Cable Company's wire, which comes down from the United States via Galveston, to Mexico, Central America, and which is continued on in the Pacific Ocean to Valparaiso, and has a land line across the continent to Buenos Ayres.

The other is the West India and Panama direct cable system, whose wires reach all the West Indies islands, and also Key West. Both of these companies are doing business on the Isthmus. There is another outlet by way of Jamaica and Bermuda to Halifax, and so to the United States.

SUPPLEMENTAL REPORT

OF

MAJOR-GENERAL GEORGE W. DAVIS, U. S. A. (Retired),
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Panama canal.

Documents, etc.

Records of the Author

no. 29

X-TC 777

5

X-TC 777.5 #46

HYDRAULICS OF THE CHAGRES RIVER.

By Gen. Henry L. Abbot.

The real problem of the Isthmian Canal is one of hydraulics—not, as very generally assumed, merely one of navigation or finance. General Abbot's exact and authoritative studies, published in *THE ENGINEERING MAGAZINE*, were among the most important arguments leading originally to the selection of the right project. We are glad to be once more the medium of giving publicity to this paper, prepared at the instance of the National Academy of Sciences (April, 1910) answering affirmatively and emphatically the question, lately raised, as to the sufficiency of the water supply even with the huge locks provided by the present plans.—*THE EDITORS.*

IN projecting a canal across the Isthmus of Panama, the dominating element is not the volume of excavation at the Continental divide, but rather the hydraulics of the Chagres River whose valley must be traversed throughout the greater part of the route. The failure to appreciate this fact largely contributed to the disaster of the first French Company, and it is through the elaborate investigations of the New French Company, supplemented by those now in progress, that the problem has become perfectly understood. The climatic conditions are of primary importance in a study of the hydrology of the river, and they are so different from those of the United States that it is not without interest to contrast them.

The average annual temperature is about 80 degrees F., differing only about $2\frac{1}{2}$ degrees in winter and summer. Ice and snow are unknown. The rainfall is much less irregular than with us, being largely governed by the motion of the sun in declination. The latitude of the Isthmus is about 9 degrees north, and as the sun moves north and south between the tropics it carries with it an ascending current of moist air which, condensed by cold, forms a rain-belt varying in latitude from month to month. Its passage over the Isthmus forms two well-marked seasons; three comparatively dry months, February, March and April, when the sun is far south; two intermediate months, January and May; and seven very rainy months forming the rest of the year. The absence of frost and the comparatively normal rainfall in this region greatly assist hydraulic studies.

It may naturally be asked what river in the United States, where the climatic conditions are so different, most nearly resembles the

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Dangers of the Lock Canal

Gustav Lindenthal Wants a Revision of Panama Plans Before It Is Too Late.

Some of the recently published articles on the Panama Canal deserve more than passing attention, because they contained fair and analytical discussion of certain features of the work, on which expert engineers have decided differences of opinion.

It is most unfortunate that the largest engineering work in the history of mankind should be conducted on plans which from the beginning were thus in dispute. The vastness of the undertaking justifies the prerequisite that the plans for it shall be above question. That is not the case when criticism apparently well founded and reasoned creates serious doubts of ultimate success.

It is also most unfortunate that the canal officials should regard a discussion of the present plans of construction as an attack upon the policy of building any canal at all. This is not a fair-minded attitude, and will probably not silence those honestly differing in their judgment with the canal authorities.

It is also most unfortunate that the question of type, whether sea level or lock type, which had been submitted to an international board of expert engineers, was not allowed to be settled in the same authoritative manner as questions of law are settled in a court where a majority of Judges, after hearing argument, decides and ends the controversy.

The majority of eight engineers out of thirteen favored a sea level canal in a searching, conscientious, and well-reasoned opinion.

The minority of five engineers recommended a lock canal in an alluringly argued report, which did not convince the majority. The two principal reasons alleged in favor of the lock canal were cheapness and shorter time of construction. The first reason, cheapness, is now known to be illusory; the second reason, shorter time, no one cared anything about. Everybody was and is willing that all the time needed for good work, energetically prosecuted, shall be taken.

To no other single cause can be ascribed so many failures of engineering structures as to false notions of economy: whether it be in the type or capacity of structure, in foundations, in dimensioning, or in location. The Panama Canal is an example on the largest scale. Not long ago the undersigned had a conversation with a distinguished foreign engineer who is thoroughly posted upon Isthmian Canal matters, and who had the advantage of visiting the Isthmus himself. He had no official connection with the canal. His views are so interesting as to be worth quoting. In effect he said:

You Americans are thought to be a practical people, but you have not proved it in the Isthmian Canal matter. If your purpose was the building of a cheap lock canal, why did you not take the Nicaragua route? Although four times longer than the Panama Canal, it is one day's sailing nearer to your shores. It has a salubrious climate, an unfailing water supply from a very big

Canal always safe on our side of the globe, and our commerce to the Pacific cannot be affected as yours would be.

The writer confesses that he shares most of these views. In respect of earthquakes let the report of the first Isthmian Canal Commission speak for itself. (Page 113.)

For Panama the records show twenty-eight earthquakes. Of these twelve occurred in the three years, 1882, 1883, 1884, which illustrates the incompleteness of the record as a whole. The only one that could be called destructive was that of 1881, which destroyed nearly all the houses in Panama. The next most severe was that of Sept. 7, 1882. During this earthquake a part of the front of the cathedral in Panama was thrown down and the headquarters building of the canal company in Panama was cracked; the railroad had its track and roadbed in places thrown out of line, and the masonry of three or four bridges and culverts was damaged; at Las Cruces the church was thrown down, at Colon some lives were lost and crevasses opened, and the Jannetas telegraph cable was broken.

Further, on Page 114, the report says: "It is possible that a fissure might open which would drain the (lock) canal, and if it remained open might destroy it."

But after making this admission the report adds the astounding conclusions "This possibility should not be erected by the fancy into a threatening danger."

That was written in 1901, before the catastrophic earthquakes at Kingston and San Francisco—both within the middle American region of frequent seismic disturbances—had furnished awful reminders of the incalculable forces slumbering in that part of the earth crust.

Let it be admitted that the earth dam for the lock canal can safely be built. Is it not absurd to assert confidently that they will not be injured by earthquakes? Can any one foretell that earthquakes at Panama from now on will always be gentle and harmless? Let the chances for a hard shake be only one in 300 years, is it not the duty of the engineer to design, if practicable, his canal so that it will not be destroyed?

Answer to these questions has been made by the lock canal engineers. It is to the effect that an earthquake which would destroy the lock canal would likewise destroy the sea-level canal; that if the dams for the lock canal should break, the dam at Gamboa, needed for the sea-level canal (to hold back the flood waters of the Chagres River) would also break. But there is a difference. The dams for the lock canal are of earth. They cannot be of anything else. If one of them should be fissured, it would be washed away, and the canal would be destroyed. The dam at Gamboa, on the other hand, would be on a rock foundation, and would either be of reinforced masonry, or an earth dam with a core of reinforced concrete. Such dams may crack and leak badly; but they cannot crumble away as earth dams do; the leakage would go into the canal and be harmless. The Gamboa

The Sea-Level Plan for the Panama Canal

Written for THE NEW YORK TIMES by an Eminent Engineer.

The sea-level plan for a ship canal across the Isthmus of Panama provides a clear and unobstructed waterway from deep water in Limon Bay, on which Colon is located, to tidewater on the Pacific side of the Isthmus, as contemplated and laid down by the majority of the International Board of Consulting Engineers in 1906. There are a number of experienced engineers who after extended studies of the subject believe that tidal locks are not needed at the Pacific end of the canal where the range of tide may vary from nine or ten feet to possibly twenty-two feet as a maximum, but the majority of the international board believed it to be prudent and safe to contemplate the construction of such locks, and included them in the estimate of cost which they submitted. They recognized and stated, however, that the gates of those locks would be wide open at least half of the time, thus affording absolutely unobstructed navigation from one ocean to the other. The range of tide at Colon is scarcely more than a foot and a half, but it is to meet the conditions at the Pacific end of the canal that the tidal locks are contemplated. The construction now in progress of the four-mile sea-level section of canal between Pedro Miguel and La Boca will afford by the action of the tides in it some significant data bearing upon this point.

The report of the international board sets forth with great fullness and perfect clearness the advantages of the sea-level plan, and it is not necessary to restate many of them in such a paper as this. But there have been so many erroneous statements, misstatements, exaggerations, and even grotesque allusions to physical and other conditions existing on the Isthmus as affecting the sea-level plan, that a restatement of some of its principal features is now necessary.

In the letter of transmittal of the report of the international board by the then Secretary of War to the President, and in a number of public documents, the sea-level canal has been described as "tortuous" and "winding" among the hills through which the route is located across the Isthmus. As a matter of fact, the routes of both sea-level and lock plans may be considered identical from end to end without sensible error. If one route is crooked or winding the other is crooked or winding. The proposed sea-level route is crooked or winding while the lock route is straight. As a matter of fact, the lock canal route is crooked and has more angular change of direction between Bohio and Pedro Miguel than the sea-level route.

The feature of easy curves embodied in the proposed sea-level plan is that found in the existing Kiel sea-level canal, in the Manchester lock canal, and in the Suez sea-level canal. The Kiel Canal has 830 degrees of change of direction in fifty-four miles, while the Suez has 530 degrees of curvature in 104 miles, only 11 per cent. less than the sea-level plan. It should also be remembered at this point that either mode of treating the curves may be used in the sea-level plan.

Much objection has been made to the size of the waterway proposed in the sea-level plan. A minimum depth of forty feet was assumed by the majority as the

able passage of our battleship fleet through the Suez Canal in a few hours.

Again statistics show that in the four years 1904 to 1907 an average of 4,150 ships of all classes, including the largest battleships, passed through the Suez Canal, or 11 per day, all of which made a safe and quick transit, and they are doing it every day in the year in increased numbers.

In the supplement to hearings before the sub-committee of the House Committee on Appropriations it is stated in the estimate of cost of the sea-level canal, submitted apparently by the Chairman of the Isthmian Canal Commission, that the proposed sea-level plan "will furnish a two-way canal for small vessels, but a single way for vessels of the Mauritania class, and for war vessels with 85-foot beam or over." This is grossly misleading. It has already been shown that the water section of the sea-level plan is substantially greater than that of any of the three largest ship canals in the world. As a matter of fact, it is a two-way canal for practically all of the ships which would seek it at the time of its completion for a considerable period thereafter, except for the battleships of 85-foot beam or over. Inasmuch as vessels of the latter class would rarely, if ever, need to pass through the canal at the same time in opposite directions, this single exception practically disappears. It is, again, a comparatively simple detail to construct passing places whenever needed, but a lock forever bars the passage of vessels with dimensions greater than either its usable length or breadth, as would be the case even at the date of completion of the lock canal.

Some extraordinary statements have been made regarding the alleged lack of control of the Chagres River in the sea-level plan, both during construction and after completion, and in regard to alleged currents in the prism of the canal, partly due to the inflow into the canal of certain small streams, found chiefly between Gamboa and Bohio. All of these statements are without any material foundation. The control of the Chagres River and of the inflow of all the tributary streams between Gamboa and Bohio and throughout all other stretches of the entire length of the canal, was most carefully and effectively studied and provided for by the majority of the international board, by the most prominent canal engineers of the world, and the officers on that board who have had actual experience in the construction, maintenance, and operation of ship canals, both with and without locks. It was considered the best engineering procedure to take the flow of the Chagres at Gamboa into the canal under perfect control. It was also considered permissible to take into the canal the small tributary streams throughout the entire length of the canal; but inasmuch as the two largest of these small streams between Gamboa and Bohio, i. e., the Cano Quebrada and the Cano Grande, could readily and economically be made to reverse their flows out of the basin of the Chagres into that of the Trinidad by dams placed at short distances from the Chagres, it was decided to follow that procedure. It is not necessary here to repeat what is